

FEATURES

- Programmable Transconductance for Optimum Current Drive
- Accessible 1.3V Precision Reference
- Both Error Amplifier Inputs Available
- 0.7% Overall Reference Tolerance
- 0.4% Initial Accuracy
- 2.2V to 24.0V Operating Supply Voltage and User Programmable Reference
- Reference Accuracy Maintained for Entire Range of Supply Voltage
- Superior Accuracy and Easier Compensation for Optoisolator Application
- Low Quiescent Current (0.50mA Typ)

The UC39432 is an adjustable precision analog controller with 100mA sink capability if the ISET pin is grounded. A resistor between ISET and ground will modify the transconductance while decreasing the maximum current sink. This will add further control in the optocoupler configuration. The trimmed precision reference along with the non-inverting error amplifier inputs are accessible for custom configuration. A sister device, the UC39431 adjustable shunt regulator, has an on-board resistor network providing six preprogrammed voltage levels, as well as external programming capability.

The diagram illustrates the internal circuitry of the UDC-95093. Key components include a 1.30V REF block, a 5.1k resistor, a 22.4k resistor, a 0.5V block, a 16k resistor, a 5.1Ω resistor, and a transistor. The circuit is configured with pins REF (5), EA+ (4), SENSE (6), COMP (2), GND (7), VCC (3), COLL (1), and ISET (8). The circuit is enclosed in a dashed box representing the chip boundary.

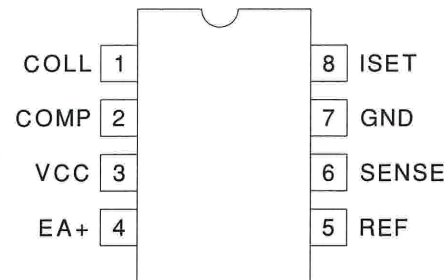
CONNECTION DIAGRAM

ABSOLUTE MAXIMUM RATINGS

Supply Voltage: VCC 24V
Regulated Output: V_{COLL} 24V
EA Input: SENSE, EA+ 6V
EA Compensation: COMP 6V
Reference Output: REF 6V
Output Sink Current: I_{COLL} 140mA
Output Source Current: ISET -140mA
Power Dissipation at T_A ≤ 25°C (DIL-8) 1W
Derate 8mW/°C for T_A > 25°C
Storage Temperature Range -65°C to +150°C
Junction Temperature -55°C to +150°C
Lead Temperature (Soldering, 10 sec.) +300°C

Currents are positive into, negative out of the specified terminal. Consult Packaging Section of Databook for thermal limitations and considerations of packages.

DIL-8, SOIC-8 (Top View)
N or J, D Package



ELECTRICAL CHARACTERISTICS: Unless otherwise stated, these specifications apply for T_A = -55°C to +125°C and COLL Output = 2.4V to 24.0V for the UC19432, T_A = -25°C to +85°C and COLL Output = 2.3V to 24.0V for the UC29432, and T_A = 0°C to +70°C and COLL Output = 2.3V to 24.0V for the UC39432, VCC = 15V, I_{COLL} = 10mA, T_A = T_J.

| PARAMETER | TEST CONDITIONS | | MIN | TYP | MAX | UNITS |
|---|---|--------|-------|------|-------|-------|
| Reference Voltage Tolerance | T _A = 25°C | 19432* | 1.295 | 1.3 | 1.305 | V |
| | | 39432B | 1.29 | 1.3 | 1.31 | V |
| Reference Temperature Tolerance | V _{COLL} = 5.0V | 19432* | 1.291 | 1.3 | 1.309 | V |
| | | 39432B | 1.286 | 1.3 | 1.314 | V |
| Reference Line Regulation | VCC = 2.4V to 24.0V, V _{COLL} = 5V | 19432* | | 10 | 38 | mV |
| | | 39432B | | 10 | 57 | mV |
| Reference Load Regulation | I _{COLL} = 10mA to 50mA, V _{COLL} = 5V | 19432* | | 10 | 38 | mV |
| | | 39432B | | 10 | 57 | mV |
| Reference Sink Current | | | | | 10 | μA |
| Reference Source Current | | | | | -10 | μA |
| EA Input Bias Current | | | -0.5 | -0.2 | | μA |
| EA Input Offset Voltage | | 19432* | | | 4.0 | mV |
| | | 39432B | | | 4.0 | mV |
| EA+ Operational Voltage Limitations | (Note 1) | | 0.9 | | 1.6 | V |
| EA Output Current Sink (Internally Limited) | | | | | 16 | μA |
| EA Output Current Source | | | | | -1 | mA |
| Minimum Operating Current | VCC = 24.0V, V _{COLL} = 5V | | | 0.50 | 0.80 | mA |
| Collector Current Limit (Note) | V _{COLL} = VCC = 24.0V, Ref = 1.35V ISET = GND | | | 130 | 145 | mA |
| Collector Saturation | I _{COLL} = 20mA | | 0.7 | 1.1 | 1.5 | V |
| Transconductance (gm) (Note) | VCC = 2.4V to 24.0V, V _{COL} = 3V, I _{COLL} = 20mA ISET = GND | 19432* | -170 | -140 | -110 | mS |
| | | 39432B | -180 | -140 | -100 | mS |
| Error Amplifier AVOL | | | 60 | 90 | | dB |
| Error Amplifier GBW | (Note 1) | | 3.0 | 5 | | MHz |
| Transconductance Amplifier GBW | | | | 3 | | MHz |

* Also applies to the UC29432 and UC39432

Note: Programmed transconductance and collector current limit equations are specified in the ISET pin description.

Note 1: Guaranteed by design. Not 100% tested in production.

OVERVOLTAGE COMPARATOR APPLICATION

The signal V_{IN} senses the input voltage. As long as the input voltage is less than 5.5V, the output is equal to the voltage on V_{IN} . During this region of operation, the diode is reversed biased which keeps the EA+ pin at 1.3V. When V_{IN} exceeds the over voltage threshold of 5.5V, the output is driven low. This forward biases the diode and creates hysteresis by changing the threshold to 4.5V.

OPTOCOUPLER APPLICATION

The optocoupler application shown takes advantage of the accessible pins REF and ISET. The ISET pin has a 33 ohm resistor to ground that protects the opto-coupler by limiting the current to about 16mA. This also lowers the transconductance to approximately 19mS. The ability to adjust the transconductance gives the designer further control of the loop gain. The REF pin is available to satisfy any high precision voltage requirements.

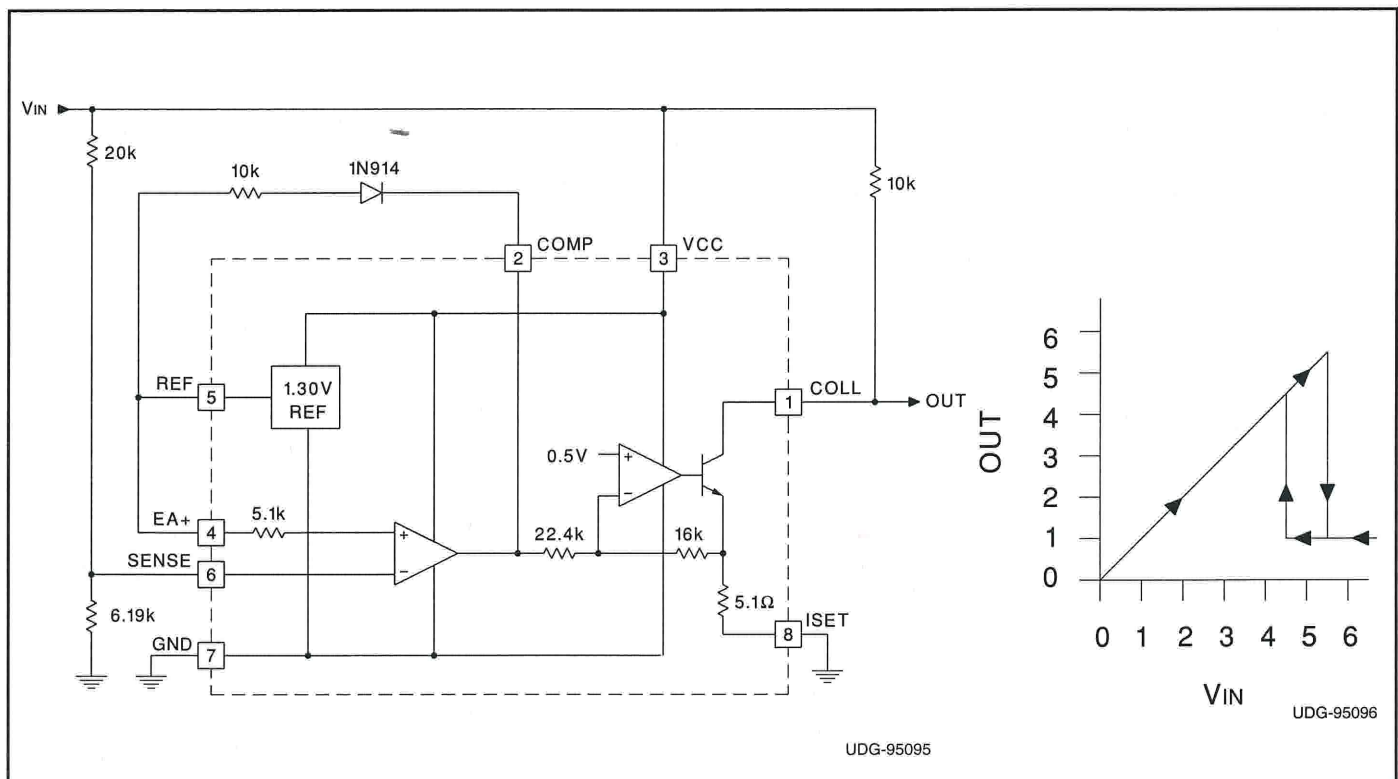


Figure 2. 5.5V Overvoltage comparator with hysteresis.

PACKAGING INFORMATION

| Orderable Device | Status ⁽¹⁾ | Package Type | Package Drawing | Pins | Package Qty | Eco Plan ⁽²⁾ | Lead/Ball Finish | MSL Peak Temp ⁽³⁾ |
|------------------|-----------------------|--------------|-----------------|------|-------------|-------------------------|------------------|------------------------------|
| UC19432J | OBSOLETE | CDIP | JG | 8 | | TBD | Call TI | Call TI |
| UC19432J883B | OBSOLETE | CDIP | JG | 8 | | TBD | Call TI | Call TI |
| UC29432D | ACTIVE | SOIC | D | 8 | 75 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-2-260C-1 YEAR |
| UC29432DG4 | ACTIVE | SOIC | D | 8 | 75 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-2-260C-1 YEAR |
| UC29432DTR | NRND | SOIC | D | 8 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-2-260C-1 YEAR |
| UC29432DTRG4 | NRND | SOIC | D | 8 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-2-260C-1 YEAR |
| UC29432N | ACTIVE | PDIP | P | 8 | 50 | Green (RoHS & no Sb/Br) | CU NIPDAU | N / A for Pkg Type |
| UC29432NG4 | ACTIVE | PDIP | P | 8 | 50 | Green (RoHS & no Sb/Br) | CU NIPDAU | N / A for Pkg Type |
| UC39432BD | ACTIVE | SOIC | D | 8 | 75 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-2-260C-1 YEAR |
| UC39432BDG4 | ACTIVE | SOIC | D | 8 | 75 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-2-260C-1 YEAR |
| UC39432BDTR | ACTIVE | SOIC | D | 8 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-2-260C-1 YEAR |
| UC39432BDTRG4 | ACTIVE | SOIC | D | 8 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-2-260C-1 YEAR |
| UC39432BN | ACTIVE | PDIP | P | 8 | 50 | Green (RoHS & no Sb/Br) | CU NIPDAU | N / A for Pkg Type |
| UC39432BNG4 | ACTIVE | PDIP | P | 8 | 50 | Green (RoHS & no Sb/Br) | CU NIPDAU | N / A for Pkg Type |
| UC39432D | ACTIVE | SOIC | D | 8 | 75 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-2-260C-1 YEAR |
| UC39432DG4 | ACTIVE | SOIC | D | 8 | 75 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-2-260C-1 YEAR |
| UC39432N | ACTIVE | PDIP | P | 8 | 50 | Green (RoHS & no Sb/Br) | CU NIPDAU | N / A for Pkg Type |
| UC39432NG4 | ACTIVE | PDIP | P | 8 | 50 | Green (RoHS & no Sb/Br) | CU NIPDAU | N / A for Pkg Type |

⁽¹⁾ The marketing status values are defined as follows:

ACTIVE: Product device recommended for new designs.

LIFEBUY: TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.

NRND: Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.

PREVIEW: Device has been announced but is not in production. Samples may or may not be available.

OBSOLETE: TI has discontinued the production of the device.

⁽²⁾ Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), or Green (RoHS & no Sb/Br) - please check <http://www.ti.com/productcontent> for the latest availability information and additional product content details.

TBD: The Pb-Free/Green conversion plan has not been defined.

Pb-Free (RoHS): TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.

Pb-Free (RoHS Exempt): This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.

Green (RoHS & no Sb/Br): TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

(3) MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

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TAPE AND REEL INFORMATION


*All dimensions are nominal

| Device | Package Type | Package Drawing | Pins | SPQ | Reel Diameter (mm) | Reel Width W1 (mm) | A0 (mm) | B0 (mm) | K0 (mm) | P1 (mm) | W (mm) | Pin1 Quadrant |
|-------------|--------------|-----------------|------|------|--------------------|--------------------|---------|---------|---------|---------|--------|---------------|
| UC29432DTR | SOIC | D | 8 | 2500 | 330.0 | 12.4 | 6.4 | 5.2 | 2.1 | 8.0 | 12.0 | Q1 |
| UC39432BDTR | SOIC | D | 8 | 2500 | 330.0 | 12.4 | 6.4 | 5.2 | 2.1 | 8.0 | 12.0 | Q1 |

TAPE AND REEL BOX DIMENSIONS



*All dimensions are nominal

| Device | Package Type | Package Drawing | Pins | SPQ | Length (mm) | Width (mm) | Height (mm) |
|-------------|--------------|-----------------|------|------|-------------|------------|-------------|
| UC29432DTR | SOIC | D | 8 | 2500 | 346.0 | 346.0 | 29.0 |
| UC39432BDTR | SOIC | D | 8 | 2500 | 346.0 | 346.0 | 29.0 |

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